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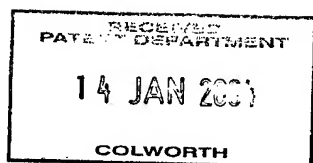
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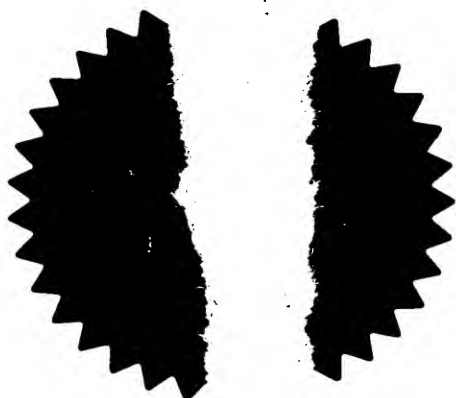
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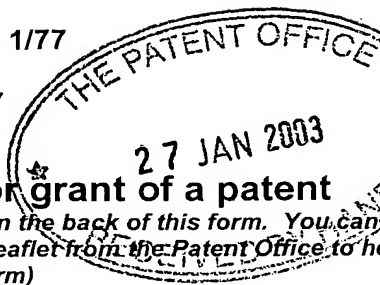
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C4286(C)

1

DETERGENT COMPOSITIONS

TECHNICAL FIELD

This invention relates to detergent compositions comprising an anionic surfactant
5 which contains both an alkyl moiety and an aryl moiety.

BACKGROUND TO THE INVENTION

The most common anionic surfactants in laundry wash compositions are linear alkyl
benzene sulphonic acids (LAS), although "linear" is somewhat of a misnomer since
the benzene group (which is sulphonated) is almost never attached to the terminal
10 atom of the alkyl chain.

Recently, there has been interest in LAS analogues in which the alkyl chain is
branched part way along the length thereof, such as disclosed in WO-A-99/05082,
WO-A-99/05084, WO-A-99/05241, WO-A-99/05242, WO-A-99/05243, WO-A-
99/05244 and WO-A-99/07656.

15 US-A- 6 043 391 discloses certain aromaticalkyl anionic surfactants and their use in
oil recovery. These compounds comprise a sulphonated or straight or branched C₇ –
C₃₀ alkyl group attached to an aromatic group, which optionally may be benzene.
The examples are based on compositions containing dialkyl benzene sulphonates in
combination with branched monoalkyl benzene sulphonate, isopropanol and ethylene
20 glycol.

We have now found that detergency in terms of removal of certain classes of soil
such as fatty/oily/greasy soils and/or one or more other advantages such as
improved solubility at low temperatures, faster foaming, higher calcium tolerance,
improved solubilisation of cosurfactants, improved rinsability, and better skin
25 mildness, can be achieved in laundry cleaning detergent compositions by including in
them, an aromaticalkyl sulphonic surfactant.



DEFINITION OF THE INVENTION

In the broadest first aspect, the present invention provides a detergent composition comprising from 0.01% to 99.9% by weight of an aromaticalkyl sulphonic surfactant, the balance being one or more other ingredients, for example selected from any
5 class, sub-class or individual ingredients recited herein.

In a second aspect of the invention, the balance of one or more other ingredients comprises at least one such ingredient other than:

- (a) a surfactant selected from cocoalkanolamides and modified forms thereof, cocamidopropyl betaine and a 9 or 10 mole ethoxylate of nonylphenol; and
- 10 (b) an organic solvent selected from ethanol, isopropanol or ethylene glycol.

The exclusions in the second aspect of the present invention mean that although optionally, any of the materials recited in (a) and (b) may be present, at least one other ingredient must be present in any composition according to that aspect of the invention. Other such ingredients are preferably chosen from the members of those
15 classes of materials which are beneficial in laundry wash products. A non-exhaustive list of these classes comprises cosurfactants, detergency builders, enzymes, bleaches, bleach systems or components thereof, anti-corrosive agents, alkali buffers, anti-foams, foam boosters, anti-redeposition and soil-suspending agents, anti-redeposition agents, softening agents such as cationic surfactants, clays,
20 softening polymers such as those containing a polysaccharide and/or a cationic polymer moiety, anti-crease and ease of ironing aids, anti-dye transfer agents and dye fixatives.

Other aspects of the present invention include a composition according to the first aspect of the present invention wherein the composition is substantially free from any
25 one or more ingredients selected from those defined in classes (a) and (b) defined in the second aspect of the present invention. As used herein, "substantially free from" means for each such ingredient, that the composition comprises less than 10%, preferably less than 5%, more preferably less than 1%, still more preferably less than

0.5%, especially less than 0.1% by weight of that ingredient or is totally devoid of that ingredient.

Yet other aspects of the present invention include any composition according to the first aspect of the present invention wherein the composition is substantially free from one or more other ingredients selected from any class, sub-class or individual ingredients recited herein.

Another aspect of the present invention provides a detergent composition comprising an aromaticalkyl sulphonic surfactant not obtained by alkylating an aromatic compound with an alkyl olefin sulphonate in the presence of a super acid catalyst under substantially anhydrous conditions, the composition comprising least one additional ingredient selected from nonionic surfactants, cationic surfactants, amphoteric surfactants, zwitterionic surfactants, detergency builders, bleaches, enzymes, polymers, perfumes and fluoescers.

A further aspect of the present invention provides a detergent composition according to the first aspect of the present invention, wherein the aromaticalkyl sulphonic surfactant comprises a C₁₄-C₁₆ aromaticalkyl sulphonic surfactant, preferably wherein the aryl moiety is benzene, optionally substituted by one or two C₁₋₄ alkyl (most preferably methyl) groups.

DETAILED DESCRIPTION OF THE INVENTION

The compositions according to the present invention must contain from 0.01% to 99.9% by weight of an aromaticalkyl sulphonic surfactant and at least one other ingredient.

The Aromaticalkyl Sulphonic Surfactant

As used herein, the term "aromaticalkyl sulphonic surfactant" excludes materials such as alkyl benzene sulphonic acid or sulphonate wherein the sulphonic acid or sulphonate group is attached to the benzene ring or other aromatic ring or ring system but instead is intended to refer to molecules wherein the sulphonic acid or sulphonate group is attached to the alkyl chain.

The aromaticalkyl sulphonic surfactant may be in the form of the aromaticalkyl sulphonic acid (AASA), ie the free acid form or in the form of a salt thereof, preferably an alkalimetal salt such as the sodium or potassium salt, or salt of an organic cation
5 such as an amine, eg monoethanolamine.

In the definition of the invention as claimed herein, the term "aromaticalkyl sulphonic surfactant" and reference to its free acid and salt forms includes both a single chemical entity falling within any of these definitions or a mixture of such entities.

Preferred aromaticalkyl surfactants are those wherein the aromaticalkyl sulphonic
10 surfactant is selected from those wherein:

- i) the aromatic compound is selected from unsubstituted, mono-substituted or poly-substituted (e.g. di-substituted) monocyclic or polycyclic (e.g. bicyclic) aromatic compounds, preferably selected from benzene and naphthalene, each optional substituent preferably being selected from alkyl, (poly)alkoxylated alkyl and -OH; and
- 15 ii) the sulfonated alkyl group attached to the aromatic compound comprises an alkyl group selected from the group consisting of linear or branched alkyl groups of 7 to 30 carbon atoms, preferably from 8 to 24, more preferably from 9 to 20, still more preferably from 12 to 18, and most preferably from 14 to 16 carbon atoms.

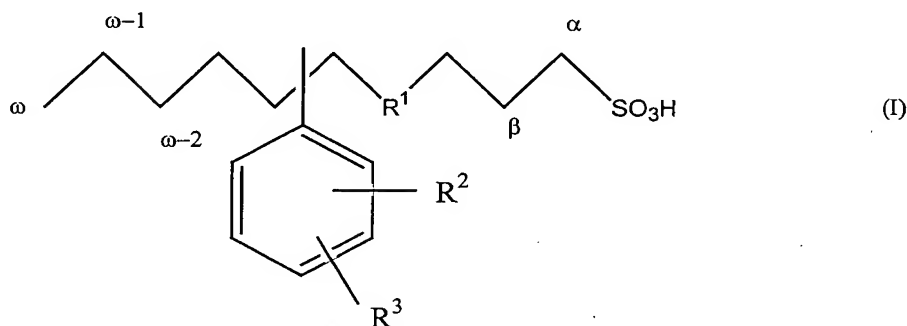
Preferably any group attached to each optional substituent in any mono- or poly- (eg
20 di-) substituted aromatic compound is selected from linear and branched chain alkyl groups of 1 to 40, preferably 1 to 30, more preferably from 1 to 20, still more preferably from 1 to 10, most preferably from 1 to 4 carbon atoms.

Any alkoxy group(s) substituted optionally incorporated in any alkyl substituent on
said aromatic compound are independently selected from ethylene oxide, propylene
25 oxide, butylene oxide, and combinations of two or more thereof, where the number of alkoxy groups range from 1 to 100.

For the avoidance of doubt, wherever a range of carbon atom chain lengths ($C_x - C_y$) is used for a straight or branched alkyl or alkenyl chain of a surfactant hydrophobe for any surfactant, in the broadest sense it means that the maximum in the

distribution of chain lengths resides somewhere in the range from x to y. However, for an aromaticallyl surfactant preferably it means that at least 60 mole %, more preferably at least 70 mole % of the surfactant has a chain having from x carbon atoms to y carbon atoms. For any other surfactant, it means that preferably at least 50 mole %, more preferably at least 60 mole % of the surfactant has a chain having from x carbon atoms to y carbon atoms.

Preferred aromaticallyl sulphonic surfactants are selected from one or more compounds of formula (I):



wherein R¹ is selected from straight and branched alkylene linkages having from 0 to 30, preferably from 1 to 20, more preferably from 2 to 15; still more preferably from 3 to 10, and most preferably from 5 to 7 carbon atoms. R² and R³ are independently hydrogen or methyl and preferably, the benzene ring is substituted to a substantial extent, eg up to 30 mole %, or up to 35% mole % or up to 40 mole % in the ω-1 or ω-2 position;

and/or salts thereof.

Some preferred compositions according to the present invention may contain from 0.1% to 65%, preferably from 2% to 30%, more preferably from 3% to 20%, especially from 4% to 15% by weight of the aromaticallyl sulphonic surfactant.

Preparation of the Aromaticalkyl Sulphonic Surfactant

The aromaticalkyl sulphonic surfactant can be prepared in its free acid form by the process described in Berger, P.D., et al., "New Anionic Aromaticalkyl Sufactants Based on Olefin Sulfonic Acids", J. Surf. and Dets., Vol. 5, No. 1 (January 2002), pp 39 – 43. This involves reacting the optionally substituted aryl moiety with the appropriate alpha olefin sulphonate. The corresponding salt forms are, of course, prepared by reacting the product with an appropriate base.

Cosurfactants

Compositions according to the invention may contain not only the aromaticalkyl surfactant but potentially any one or more other surface-active compound (surfactant) which may be chosen from soap and non-soap anionic, cationic, non-ionic, amphoteric and zwitterionic surface-active compounds and mixtures thereof. Many suitable surface-active compounds are available and are fully described in the literature, for example, in "Surface-Active Agents and Detergents", Volumes I and II, by Schwartz, Perry and Berch.

The preferred additional detergent-active compounds that can be used are soaps and synthetic non-soap anionic, nonionic and cationic surfactants. Some examples of each of these will now be described.

Other Anionic Surfactant

In addition to the aromaticalkyl sulphonic surfactant, at least one other anionic co-surfactant is preferably also present. It may for example be selected from one or more of alkylbenzene sulphonates, alkyl sulphonates, primary and secondary alkyl sulphates (in free acid and/or salt forms). The aromaticalkyl sulphonic surfactant preferably constitutes from 0.5% to 99.9%, preferably from 1% to 80%, more preferably from 10% to 60%, especially from 15% to 50%, more especially from 25% to 45% by weight of the total anionic surfactant content of the composition.

A composition according to the present invention may, for example contain from 0.1% to 70%, preferably from 1% to 40%, more preferably from 2% to 30%, especially from 3% to 20% of alkylbenzene sulphonic surfactant (in free acid and/or salt form).

- 5 When it is desired further to enhance calcium intolerance, then any anionic surfactant in the composition which is additional to the aromatically alkyl surfactant, may comprise (preferably at a level of 70 wt% or more of the total anionic surfactant) or consist only of one or more calcium-tolerant non-soap anionic surfactants.
- 10 As referred to herein, a "calcium tolerant" anionic surfactant is one that does not precipitate at a surfactant concentration of 0.4 g/l (and at an ionic strength of a 0.040 M 1:1 salt solution) with a calcium concentration up to 20° FH (French hardness degrees), i.e. 200 ppm calcium carbonate.
- 15 A preferred additional class of non-soap calcium tolerant anionic surfactants for use in the compositions of the present invention comprises the alpha-olefin sulphonate.

Another preferred class of calcium tolerant anionic surfactants comprise the mid-chain branched materials disclosed in WO-A-99/05082, WO-A-99/05084, WO-A-
20 99/05241, WO-A-99/05242, WO-A-99/05243, WO-A-99/05244 and WO-A-99/07656.

Yet another suitable class of calcium tolerant anionic surfactants comprises the alkyl ether sulphates (ie the (poly)alkoxylated alkyl sulphates).

Another suitable calcium tolerant anionic surfactants to be used in combination
25 comprises alpha-olefin sulphonate and alkyl ether sulphate in a weight ratio of from 5:1 to 1:15.

Other calcium-tolerant anionic surfactants that may be used are alkyl ethoxy carboxylate surfactants (for example, Neodox (Trade Mark) ex Shell), fatty acid ester
30 sulphonates (for example, FAES MC-48 and ML-40 ex Stepan), alkyl xylene or toluene sulphonates, dialkyl sulphosuccinates, alkyl amide sulphates, sorpholipids,

alkyl glycoside sulphates and alkali metal (e.g. sodium) salts of saturated or unsaturated fatty acids.

- 5 Yet other suitable anionic surfactants in addition to the calcium tolerant anionics are well-known to those skilled in the art. Examples include primary and secondary alkyl sulphates, particularly C₈-C₁₅ primary alkyl sulphates; and dialkyl sulphosuccinates. Sodium salts are generally preferred.

Soaps

- 10 Optionally, a soap may also be present. Suitable soaps include those having a chain length ranging from C₁₂ to C₂₀, mainly saturated, and optionally containing limited levels of 1 or 2 unsaturated bonds, and derived from natural oils and fats such as for example: (hardened or non-hardened) Tallow, Coconut, or Palm Kernel.
- 15 In a solid formulation, the amount of optional soap is preferably from 0.1% to 10%, more preferably from 0.1% to 5% by weight of the composition. In liquid compositions, the level of optional soap is preferably from 0.1% to 20%, more preferably from 5% to 15% by weight of the composition.

20 Optional other surfactants

Optional other surfactants include nonionic surfactants, cationic surfactants (for detergency enhancement and/or fabric softening), amphoteric and zwitterionic surfactants.

25

- If desired, nonionic surfactant may also be included. The amount of these materials, in total, is preferably from 0.01% to 50%, preferably from 0.1% to 35%, more preferably from 0.5% to 25%, still more preferably from 0.7% to 20%, even more preferably from 0.8% to 15%, especially from 1% to 10% and even more especially
- 30 from 1% to 7% by weight of the composition.

Preferred nonionic surfactants are aliphatic alcohols having an average degree of ethoxylation of from 2 to 12, more preferably from 3 to 10. Preferably, the aliphatic alcohols are C₈-C₁₆, more preferably C₁₀-C₁₅.

- 5 The mid-chain branched hydrophobe nonionics disclosed in WO-A-98/23712 are another class of suitable nonionic surfactants.

Suitable other non-ethoxylated nonionic surfactants include alkylpolyglycosides, glycerol monoethers, and polyhydroxyamides (glucamide).

10

Optionally, a composition according to the present invention may comprise from 0.05% to 10%, preferably from 0.1% to 5%, more preferably from 0.25% to 2.5%, especially from 0.5% to 1% by weight of cationic surfactant.

- 15 Suitable cationic fabric softening compounds are substantially water-insoluble quaternary ammonium materials comprising a single alkyl or alkenyl long chain having an average chain length greater than or equal to C₂₀ or, more preferably, compounds comprising a polar head group and two alkyl or alkenyl chains having an average chain length greater than or equal to C₁₄. Preferably the fabric softening compounds have two long chain alkyl or alkenyl chains each having an average
20 chain length greater than or equal to C₁₆. Most preferably at least 50% of the long chain alkyl or alkenyl groups have a chain length of C₁₈ or above. It is preferred if the long chain alkyl or alkenyl groups of the fabric softening compound are predominantly linear.

- 25 Quaternary ammonium compounds having two long-chain aliphatic groups, for example, distearyl dimethyl ammonium chloride and di(hardened tallow alkyl) dimethyl ammonium chloride, are widely used in commercially available rinse conditioner compositions. Other examples of these cationic compounds are to be found in "Surfactants Science Series" volume 34 ed. Richmond 1990, volume 37 ed.
30 Rubingh 1991 and volume 53 eds. Cross and Singer 1994, Marcel Dekker Inc. New York".

It is also possible to include certain mono-alkyl cationic surfactants which can be used for their detergency. Cationic surfactants that may be used for this purpose include quaternary ammonium salts of the general formula $R_1R_2R_3R_4N^+ X^-$ wherein the R groups are long or short hydrocarbon chains, typically alkyl, hydroxyalkyl or ethoxylated alkyl groups, and X is a counter-ion (for example, compounds in which R_1 is a C_8 - C_{22} alkyl group, preferably a C_8 - C_{10} or C_{12} - C_{14} alkyl group, R_2 is a methyl group, and R_3 and R_4 , which may be the same or different, are methyl or hydroxyethyl groups); and cationic esters (for example, choline esters).

10

Detergency Builders

The compositions of the invention, when used as laundry wash compositions, will quite often also contain one or more detergency builders. The total amount of detergency builder in the compositions will typically range from 1% to 80 wt%, preferably from 2% to 60 wt%, more preferably from 4% to 30% by weight of the total composition.

Inorganic builders that may be present include sodium carbonate, if desired in combination with a crystallisation seed for calcium carbonate, as disclosed in GB-A-1 437 950; crystalline and amorphous aluminosilicates, for example, zeolites as disclosed in GB-A-1 473 201, amorphous aluminosilicates as disclosed in GB-A-1 473 202 and mixed crystalline/amorphous aluminosilicates as disclosed in GB-A-1 470 250; and layered silicates as disclosed in EP-A-164 514. Inorganic phosphate builders, for example, sodium orthophosphate, sodium pyrophosphate and sodium tripolyphosphate (STP) are also suitable for use with this invention.

The compositions of the invention preferably contain an alkali metal, preferably sodium, aluminosilicate builder. Sodium aluminosilicates may generally be incorporated in amounts of from 10 to 70% by weight (anhydrous basis), preferably from 20 to 50 wt%.

When the aluminosilicate is zeolite, preferably the maximum amount is 30% by weight.

The alkali metal aluminosilicate may be either crystalline or amorphous or mixtures thereof, having the general formula: $0.8-1.5 \text{ Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 0.8-6 \text{ SiO}_2$.

- 5 These materials contain some bound water and are required to have a calcium ion exchange capacity of at least 50 mg Ca/g. The preferred sodium aluminosilicates contain 1.5-3.5 SiO_2 units (in the formula above). Both the amorphous and the crystalline materials can be prepared readily by reaction between sodium silicate and sodium aluminate, as amply described in the literature. Suitable crystalline sodium
10 aluminosilicate ion-exchange detergency builders are described, for example, in GB-A-1 429 143. The preferred sodium aluminosilicates of this type are the well-known commercially available zeolites A and X, and mixtures thereof.

- The zeolite may be the commercially available zeolite 4A now widely used in laundry
15 detergent powders. However, according to a preferred embodiment of the invention, the zeolite builder incorporated in the compositions of the invention is maximum aluminium zeolite P (zeolite MAP) as described and claimed in EP-A-384 070. Zeolite MAP is defined as an alkali metal aluminosilicate of the zeolite P type having a silicon to aluminium ratio not exceeding 1.33, preferably within the range of from 0.90 to 1.33,
20 and more preferably within the range of from 0.90 to 1.20.

- Especially preferred is zeolite MAP having a silicon to aluminium ratio not exceeding 1.07, more preferably about 1.00. The calcium binding capacity of zeolite MAP is generally equivalent to at least 150 mg CaO per g of anhydrous material.

- 25 Organic builders that may be present include polycarboxylate polymers such as polyacrylates, acrylic/maleic copolymers, and acrylic phosphinates; monomeric polycarboxylates such as citrates, gluconates, oxydisuccinates, glycerol mono-, di and trisuccinates, carboxymethyloxy succinates, carboxymethyloxymalonates,
30 dipicolinates, hydroxyethyliminodiacetates, alkyl- and alkenylmalonates and succinates; and sulphonated fatty acid salts. This list is not intended to be exhaustive.

Especially preferred organic builders are citrates, suitably used in amounts of from 2 to 30 wt%, preferably from 5 to 25 wt%; and acrylic polymers, more especially acrylic/maleic copolymers, suitably used in amounts of from 0.5 to 15 wt%, preferably from 1 to 10 wt%.

5

Builders, both inorganic and organic, are preferably present in alkali metal salt, especially sodium salt, form.

Bleaches

10

Laundry wash compositions according to the invention may also suitably contain a bleach system. Fabric washing compositions may desirably contain peroxy bleach compounds, for example, inorganic persalts or organic peroxyacids, capable of yielding hydrogen peroxide in aqueous solution.

15

Suitable peroxy bleach compounds include organic peroxides such as urea peroxide, and inorganic persalts such as the alkali metal perborates, percarbonates, perphosphates, persilicates and persulphates. Preferred inorganic persalts are sodium perborate monohydrate and tetrahydrate, and sodium percarbonate.

20

Especially preferred is sodium percarbonate having a protective coating against destabilisation by moisture. Sodium percarbonate having a protective coating comprising sodium metaborate and sodium silicate is disclosed in GB-A-2 123 044.

25

The peroxy bleach compound is suitably present in an amount of from 0.1 to 35 wt%, preferably from 0.5 to 25 wt%. The peroxy bleach compound may be used in conjunction with a bleach activator (bleach precursor) to improve bleaching action at low wash temperatures. The bleach precursor is suitably present in an amount of from 0.1 to 8 wt%, preferably from 0.5 to 5 wt%.

30

Preferred bleach precursors are peroxycarboxylic acid precursors, more especially peracetic acid precursors and peroxoanoic acid precursors. Especially preferred bleach precursors suitable for use in the present invention are N,N,N',N',-tetracetyl

ethylenediamine (TAED) and sodium nonanoyloxybenzene sulphonate (SNOBS). The novel quaternary ammonium and phosphonium bleach precursors disclosed in US 4 751 015 and US-A-4 818 426 and EP-A-402 971, and the cationic bleach precursors disclosed in EP-A-284 292 and EP-A-303 520 are also of interest.

5

The bleach system can be either supplemented with or replaced by a peroxyacid. examples of such peracids can be found in US-A- 4 686 063 and US-A- 5 397 501. A preferred example is the imido peroxydicarboxylic class of peracids described in EP-A-325 288, EP-A-349 940, DE-A-382 3172 and EP-A-325 289. A particularly preferred example is phthalimido peroxy caproic acid (PAP). Such peracids are suitably present at 0.1 - 12%, preferably 0.5 - 10%.

10

A bleach stabiliser (transition metal sequestrant) may also be present. Suitable bleach stabilisers include ethylenediamine tetra-acetate (EDTA), the polyphosphonates such as Dequest (Trade Mark) and non-phosphate stabilisers such as EDDS (ethylene diamine di-succinic acid). These bleach stabilisers are also useful for stain removal especially in products containing low levels of bleaching species or no bleaching species.

15

An especially preferred bleach system comprises a peroxy bleach compound (preferably sodium percarbonate optionally together with a bleach activator), and a transition metal bleach catalyst as described and claimed in EP-A-458 397, EP-A-458 398 and EP-A-509 787.

20

25 Enzymes

Laundry wash compositions according to the invention may also contain one or more enzyme(s). Suitable enzymes include the proteases, amylases, cellulases, oxidases, peroxidases and lipases usable for incorporation in detergent compositions.

Preferred proteolytic enzymes (proteases) are, catalytically active protein materials which degrade or alter protein types of stains when present as in fabric stains in a hydrolysis reaction. They may be of any suitable origin, such as vegetable, animal, bacterial or yeast origin.

30

Proteolytic enzymes or proteases of various qualities and origins and having activity in various pH ranges of from 4-12 are available and can be used in the instant invention. Examples of suitable proteolytic enzymes are the subtilisins which are obtained from
5 particular strains of B. Subtilis B. licheniformis, such as the commercially available subtilisins Maxatase (Trade Mark), as supplied by Gist Brocades N.V., Delft, Holland, and Alcalase (Trade Mark), as supplied by Novo Industri A/S, Copenhagen, Denmark.

Particularly suitable is a protease obtained from a strain of Bacillus having maximum
10 activity throughout the pH range of 8-12, being commercially available, e.g. from Novo Industri A/S under the registered trade-names Esperase (Trade Mark) and Savinase (Trade-Mark). The preparation of these and analogous enzymes is described in GB 1 243 785. Other commercial proteases are Kazusase (Trade Mark obtainable from Showa-Denko of Japan), Optimase (Trade Mark from Miles Kali-Chemie, Hannover,
15 West Germany), and Superase (Trade Mark obtainable from Pfizer of U.S.A.).

Detergency enzymes are commonly employed in granular form in amounts of from about 0.1 to about 3.0 wt%. However, any suitable physical form of enzyme may be used.
20

Other Optional Minor Ingredients

The compositions of the invention may contain alkali metal, preferably sodium carbonate, in order to increase detergency and ease processing. Sodium carbonate
25 may suitably be present in amounts ranging from 1 to 60 wt%, preferably from 2 to 40 wt%. However, compositions containing little or no sodium carbonate are also within the scope of the invention.

Powder flow may be improved by the incorporation of a small amount of a powder
30 structurant, for example, a fatty acid (or fatty acid soap), a sugar, an acrylate or acrylate/maleate copolymer, or sodium silicate. One preferred powder structurant is fatty acid soap, suitably present in an amount of from 1 to 5 wt%.

Yet other materials that may be present in detergent compositions of the invention include sodium silicate; antiredeposition agents such as cellulosic polymers; inorganic salts such as sodium sulphate; lather control agents or lather boosters as appropriate; dyes; coloured speckles; perfumes; foam controllers; fluorescers and decoupling
5 polymers. This list is not intended to be exhaustive.

Product Form

Compositions of the present invention may be provided as powders, tablets, aqueous
10 or substantially non-aqueous liquids. Optionally, liquid compositions may be provided in water soluble sachets. Liquid compositions may have different compositions from solid compositions and may for example comprise from 5% to 60%, preferably from 10% to 40% by weight of anionic surfactant (at least some of which will, of course, be aromaticallyl sulphonic surfactant, from 2.5% to 60%, preferably from 5% to 35% by
15 weight of nonionic surfactant and from 2% to 99% by weight of water. Optionally, liquid compositions may for example contain from 0.1% to 20%, preferably from 5% to 15% by weight of soap.

Preparation of the compositions

20

The compositions of the invention may be prepared by any suitable process.

The choice of processing route may be in part dictated by the stability or heat-sensitivity of the surfactants involved, and the form in which they are available.

25

For granular products, ingredients such as enzymes, bleach ingredients, sequestrants, polymers and perfumes which are traditionally added separately (e.g. enzymes postdosed as granules, perfumes sprayed on) may be added after the processing steps outlined below.

30

Suitable processes include:

(1) drum drying of principal ingredients, optionally followed by granulation or postdosing of additional ingredients;

(2) non-tower granulation of all ingredients in a high-speed mixer/granulator, for example, a Fukae (Trade Mark) FS series mixer, preferably with at least one surfactant in paste form so that the water in the surfactant paste can act as a binder;

(3) non-tower granulation in a high speed/moderate speed granulator combination, thin film flash drier/evaporator or fluid bed granulator.

10 EXAMPLES

Composition Examples

wt %

| Example | | A | 1 | B | 2 | C | 3 |
|------------------------------|--|-------|-------|-------|-------|-------|-------|
| NaLAS | | 11.81 | 0.00 | 11.81 | 0.00 | 11.81 | 7.88 |
| Soap | | 1.79 | 1.79 | 1.79 | 1.79 | 1.79 | 1.79 |
| Nonionic EO5 | | 3.94 | 3.94 | 3.94 | 3.94 | 3.94 | 3.94 |
| NaAASA | | 0 | 11.81 | 0 | 11.81 | 0 | 3.94 |
| STP | | 0 | 0 | 10.46 | 10.46 | 0 | 0 |
| Zeolite A24 | | 20.92 | 20.92 | 10.46 | 10.46 | 10.46 | 10.46 |
| Na Carbonate | | 13.07 | 13.07 | 13.07 | 13.07 | 13.07 | 13.07 |
| Copolymer Builder | | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 |
| Na Sulphate | | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Na disilicate | | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 |
| Silicone Antifoam | | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Fluorescer | | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Sodium Carbonate | | 4.25 | 4.25 | 4.25 | 4.25 | 4.25 | 4.25 |
| Na Silicate/ Na Carbonate | | 3.35 | 3.35 | 3.35 | 3.35 | 3.35 | 3.35 |
| Bleach Stabilizer | | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 |
| Citric acid | | 2.55 | 2.55 | 2.55 | 2.55 | 2.55 | 2.55 |
| TAED (83% active) | | 2.75 | 2.75 | 2.75 | 2.75 | 2.75 | 2.75 |
| Na Percarbonate | | 13.25 | 13.25 | 13.25 | 13.25 | 13.25 | 13.25 |
| Savinase 12.0 TXT | | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Thermamyl 60T | | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| Carezyme 900T | | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 |
| Water | | bal. | bal. | bal. | bal. | bal. | bal. |

"bal." = balance

5 Comparative Data

The above compositions were tested for washing performance, dosed at 5.0g/l in a solution at 40°C at a water hardness of 20° French Hard with a Ca:Mg hardness ratio of 4:1. The wash time was 30 minutes. Compositions A, 1, C and 3 were tested on a polyester/cotton soiled with sunflower oil. Compositions B and 2 were tested on biro inter stain on cotton. The results were as follows:

| Change (ΔE) | | | | | | |
|-----------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Example: | A | 1 | B | 2 | C | 3 |
| Run | | | | | | |
| 1 | 12.5 | 26.0 | 40.8 | 43.7 | 16.8 | 24.3 |
| 2 | 17.2 | 23.0 | 38.9 | 43.6 | 17.3 | 19.5 |
| 3 | 13.2 | 24.2 | 38.7 | 45.0 | 16.8 | 21.3 |
| 4 | 11.9 | 21.1 | 40.0 | 45.8 | 17.2 | 24.5 |
| Average | 13.7 | 23.6 | 39.6 | 44.6 | 17.0 | 22.4 |
| Standard Deviation | 2.4 | 2.1 | 1.0 | 1.1 | 0.3 | 2.4 |

ΔE represents the change in lightness in the three dimensional colour space hue/saturation/lightness. The greater the number, the greater is the degree of stain removal.

Preparation of MLAS

The MLAS was made following WO 99/05084 (PCT/IB98/01097) EXAMPLE 2 (pg. 25). Specifically, it was prepared via an alcohol derived from a positionally nonselectively hydroformylated linear olefin. A 5 g sample of ISALCHEM 123(R) (ex ENICHEM) is added to a glass autoclave liner along with 70 ml of benzene and 1 g of a shape selective catalyst (solid form, acidic mordenite catalyst: Zeocat(R) FM-8/25H (ex ZEOCHEM)). The glass liner is sealed inside a stainless steel autoclave. The autoclave is purged twice with 250 psig nitrogen, and then charged to 1000 psig

nitrogen. With mixing, the mixture is heated to 180-200°C overnight for 14-15 hours at which time it is then cooled and removed from the autoclave. The reaction mixture is filtered to remove catalyst and concentrated by evaporation of benzene using rotary evaporator to obtain a clear colorless or nearly colorless

- 5 liquid product. The modified alkylbenzene mixture is then sulfonated with a molar equivalent of chlorosulfonic acid using methylene chloride as solvent. The methylene chloride is removed, the product neutralized with sodium methoxide in methanol and the methanol evaporated to give modified alkylbenzene sulfonate, sodium salt mixture.

10

C13 NMR measured: 58.3% on the mid-chain branching position, the other branches were distributed on the 2- and 3- and on the ω 2- position.

| | Examples D, 4, E (wt %) | Examples F, 5, G (wt %) |
|--------------------------|-------------------------------|-------------------------------|
| Anionic | 8.89 | 8.89 |
| Nonionic EO7 | 6.95 | 6.95 |
| Zeolite A24 | 21.03 | 10.52 |
| Na-Carbonate | 13.54 | 13.54 |
| Copolymer Builder | 1.16 | 1.16 |
| Na-Sulphate | 10.79 | 10.79 |
| Na-DiSilicate | 1.12 | 1.12 |
| Soap | 1.69 | 1.69 |
| Antifoam | 1.30 | 1.30 |
| Antiredeposition Polymer | 0.20 | 0.20 |
| Fluorescer (15%) | 0.85 | 0.85 |
| Na-carbonate | 2.99 | 2.99 |
| Na Silicate/Na Carbonate | 3.15 | 3.15 |
| Bleach Stabiliser | 1.1 | 1.1 |
| Citric acid | 2.56 | 2.56 |
| TAED (83% active) | 2.75 | 2.75 |
| NaPercarbonate | 13.20 | 13.20 |
| Savinase 12.0 TXT | 0.52 | 0.52 |
| Thermamyl 60T | 0.33 | 0.33 |
| Carezyme 900T | 0.21 | 0.21 |
| Water | bal. | bal. |

15

Anionic in examples: D: NaLAS, 4 - NaAASA, E - MLAS

F: NaLAS, 5 - NaAASA, G - MLAS

Comparative Data

- 5 ΔE values are as follows. Conditions: 5g/l, 40°C and 20°FH:

| Example | D | 4 | E | F | 5 | G |
|----------|------|------|------|----------|----------|----------|
| Stain | Ink | Ink | Ink | Lipstick | Lipstick | Lipstick |
| Run 1 | 34.2 | 36.1 | 32.3 | 23.6 | 31.2 | 22.5 |
| Run 2 | 34.2 | 37.1 | 33.6 | 26.0 | 33.0 | 24.6 |
| run 3 | 29.9 | 34.3 | 30.3 | 24.2 | 31.8 | 24.8 |
| run 4 | 32.9 | 38.2 | 33.9 | 26.5 | 29.9 | 25.2 |
| average | 32.8 | 36.4 | 32.5 | 25.1 | 31.4 | 24.3 |
| std. dev | 2.0 | 1.6 | 1.6 | 1.4 | 1.3 | 1.2 |

Raw Material Specification

- 10 NaLAS - Dobanic Acid, C₁₀– C₁₃ alkylbenzene sulphonic acid sodium salt, ex shell, 95 wt % active.

MLAS – Mid-chain branched alkylbenzene sulphonate sodium salt (see preparation above).

- 15 Soap - hardened tallow fatty acid, Pristerene 4916 ex Unigema.

Nonionic EO5 - C₁₃ - C₁₅ fatty alcohol ethoxylated with an average of 5 ethyleneoxide units per mole, Lutensol AO5 ex BASF.

Nonionic EO7 - C₁₃ - C₁₅ fatty alcohol ethoxylated with an average of 7 ethyleneoxide units per mole, Lutensol AO7 ex BASF.

- 5 NaAASA - Aryl (ie. benzene) C₁₄ - C₁₆ alkyl sulphonic acid sodium salt prepared *per* Berger P.D., et al *supra*.

STP - sodium tripolyphosphate

Copolymer Builder - Sokalan CP5 Acrylate/Mateate (70:30) Copolymer Builder ex BASF.

- 10 Silicone antifoam - Adjunct granule containing 18 wt % active, ex Dow Corning.

Fluorescer - Adjunct granule, containing 17.5 wt % active whitening agent (Tinopal DMSX).

- 15 Na Silicate/Na Carbonate - Granule of sodium silicate and ex CIBA sodium carbonate (29 wt %/55 wt %), Nabion 15, ex Rhodia.

Bleach Stabilizer - ethylene diamine tetramethylene phosphonic acid Ca/Na salt, Dequest 2047, ex Monsanto.

20

TAED - Tetraacetylenediamine (80% active) ex Clarint

Savinase 12.0 TXT - protease enzyme, ex Novo

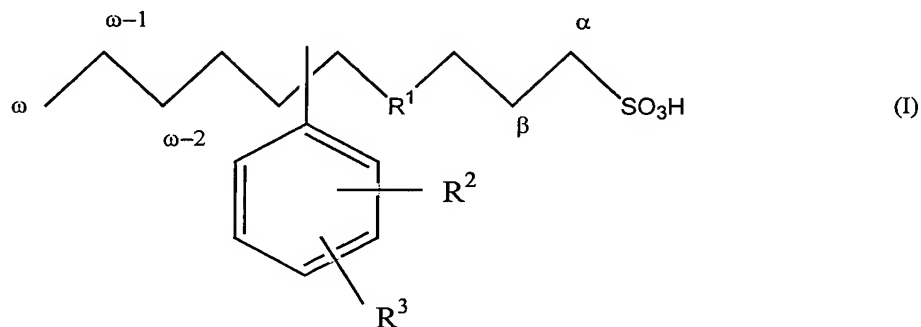
- 25 Thermamyl 60T - amylase enzyme, ex Novo

Carezyme 900T - cellulase enzyme, ex Novo

CLAIMS

1. A detergent composition comprising from 0.01% to 99.9% by weight of an aromaticalkyl sulphonic surfactant, the balance being one or more other ingredients, other than:
 - 5 (a) a surfactant selected from cocoalkanolamides and modified forms thereof, cocamidopropyl betaine and a 9 or 10 mole ethoxylate of nonylphenol; and
 - (b) an organic solvent selected from ethanol, isopropanol or ethylene glycol.
2. A composition according to claim 1, wherein the aromaticalkyl sulphonic surfactant is selected from those wherein:
 - 10 i) the aromatic compound is selected from unsubstituted, mono-substituted or poly-substituted (e.g. di-substituted) monocyclic or polycyclic (e.g. bicyclic) aromatic compounds, preferably selected from benzene and naphthalene, each optional substituent preferably being selected from alkyl, (poly)alkoxylated alkyl and -OH; and
 - 15 ii) the sulfonated alkyl group attached to the aromatic compound comprises an alkyl group selected from the group consisting of linear or branched alkyl groups of 7 to 30 carbon atoms, preferably from 8 to 24, more preferably from 9 to 20, still more preferably from 12 to 18, most preferably from 14 to 16 carbon atoms.
3. A composition according to claim 2, wherein any group attached to each optional substituent in any mono- or poly- (eg di-) substituted aromatic compound is
20 selected from linear and branched chain alkyl groups of 1 to 40, preferably 1 to 30, more preferably from 1 to 20, still more preferably from 1 to 10, and most preferably from 1 to 4 carbon atoms.
4. A composition according to claim 2 or claim 3, wherein any alkoxy group(s)
25 optionally incorporated in any alkyl substituent on said aromatic compound are independently selected from ethylene oxide, propylene oxide, butylene oxide, and combinations of two or more thereof, where the number of alkoxy groups range from 1 to 100.

5. A composition according to any preceding claim, wherein the aromatically sulphonic surfactant is selected from one or more compounds of formula (I):



wherein R^1 is selected from straight and branched alkylene linkages having from 0 to 30, preferably from 1 to 20, more preferably from 2 to 15, still more preferably from 3 to 10, and most preferably from 5 to 7 carbon atoms. R^2 and R^3 are independently hydrogen or methyl and preferably, the benzene ring is substituted to a substantial extent, eg up to 30 mole %, or up to 35% mole % or up to 40 mole % in the ω -1 or ω -2 position;

10 and/or salts thereof.

6. A composition according to any preceding claim, comprising from 0.1% to 65%, preferably from 2% to 30%, more preferably from 4% to 20%, especially from 5% to 15% by weight of the aromatically sulphonic surfactant.

7. A composition according to any preceding claim, comprising one or more anionic co-surfactants, the aromatically sulphonic surfactant constituting from 0.5% to 99.9%, preferably from 1% to 80%, more preferably from 10% to 60%, especially from 15% to 50%, more especially from 25% to 45% by weight of the total anionic surfactant content of the composition:

15

8. A composition according to any preceding claim, comprising from 0.1% to 70%, preferably from 1% to 40%, more preferably from 2% to 30%, especially from 3% to 20% of alkylbenzene sulphonic surfactant (in free acid and/or salt form).

20

9. A composition according to any preceding claim, comprising from 0.01% to 50%, preferably from 0.1% to 35%, more preferably from 0.5% to 25%, still more preferably from 0.7% to 20%, even more preferably from 0.8% to 15%, especially from 1% to 10% and even more especially from 1% to 7% by weight of the composition of nonionic surfactant.

10. A composition according to any preceding claim, comprising from 0.05% to 10%, preferably from 0.1% to 5%, more preferably from 0.25% to 2.5%, especially from 0.5% to 1% by weight of cationic surfactant.

10 11. A composition according to any preceding claim, comprising from 1% to 80%, preferably from 2% to 60%, more preferably from 4% to 30% by weight of the composition of detergency builder.

ABSTRACT

DETERGENT COMPOSITIONS

5 A detergent composition comprising from 0.01% to 99.9% by weight of an
aromaticalkyl sulphonic surfactant, the balance being one or more other ingredients.

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